(19) Japan Patent Office (JP)

(12) Publication of an Unexamined Patent Application (A)

(11) Patent number: **Tokkai 04-250898**

(45) Publication date: September 7, 1992

(51) Int.Cl.[5]		Identifying symbols	FI	Technology indication locations
C02F 3/30	B	7158-4D		
3/06		6847-4D		
3/20	C	7726-4D		

Request for examination: Not made Number of claims 1 FD (total 4 pages [in original])

(21) Application Number: 02-417214

(22) Filing Date: December 28, 1990

(71) Applicant: 000006781
YANMAR DIESEL ENGINE CO., LTD.
1-32, Chayamachi, Kita-ku, Osaka

(72) Inventor: Takeo KATO
YANMAR DIESEL ENGINE CO., LTD.
1-32, Chayamachi, Kita-ku, Osaka

(74) Agent: Patent Attorney
Hiroshi [?] SHINODA

(54) Title of Invention: BATCH-TYPE WASTEWATER TREATMENT DEVICE

(57) Abstract

Purpose

To prevent the enlargement of the microorganism layers on contact material by improving the aeration system in a batch-type wastewater treating device packed with contact material 3 in a treatment tank 1.

Constitution

A 1st air diffuser device 4 which is so constituted that the ascending flow by the aeration bubbles comes into contact with the contact material 3, and a 2nd air diffuser device 5 which is so constituted that the descending flow by the aeration bubbles comes into contact with the contact material 3 are provided. The air diffuser device 4 and the air diffuser device 5 are alternately operated.

Effect

The surfaces of the contact material 3 are washed and the aerobic and anaerobic microorganisms admixed with the contact material 3 and affect each other to sufficiently suppress their microorganism activity since the ascending and descending flows come into contact alternately with the contact material 3. Thus, dislodging of the microorganism layers due to enlargement is prevented.

[figure callouts]

Treatment Tank	1
Filtrate	2
Contact Material	3
1st Air Diffuser Device	4
2nd Air Diffuser Device	5

Claims

Claim 1

A batch-type wastewater treatment device in which the batch-type wastewater treatment device has a treatment tank filled with contact material, a 1st air diffuser means disposed so that the ascending flow comes into contact with the contact material, a 2nd air diffuser means disposed so that the descending flow comes into contact with the contact material, and so that the first and second air diffuser means operate alternately.

Detailed Description of the Invention

0001

Industrial Field of Use

This invention relates to improved batch-type wastewater treatment devices that use contact material.

0002

Prior Art

Batch-type wastewater treatment devices have treatment tanks that are filled with contact material that retains microorganisms. By mixing and propagating anaerobic and aerobic microorganisms on this contact material, the contact material controls the concentration of active microorganisms, preventing the excessive propagation of microorganisms, thereby preventing the creation of large quantities of activated sludge. At the same time, a goal of the contact material is to increase the treatment performance of the device. (See, for example, the present applicant's patent filing 2-86176.) Also, an air diffuser means is provided in the treatment tank, and fine bubbles are released during the bubbling phase by the air diffuser means to promote the reaction.

0003

Problems the Invention is Intended to Resolve

In these types of devices that use contact material, the repetition of the bubbling cycle results in the buildup of microorganism layers on the contact material, with the result that the anaerobic layer increases inside the contact material, thereby retarding the reaction. Moreover, the thickened microorganism layers are apt to become dislodged, and when they are dislodged, the device's treatment performance declines and troublesome replacement becomes necessary. Preventive measures such as periodic washing have been required in order to prevent these problems.

0004

In light of these issues, the present invention is intended to prevent the enlargement of the microorganism layer on the contact material by making improvements to the bubbling method.

0005

Means of Solving the Problems

In order to achieve this objective, the batch-type wastewater treatment device of the present invention is provided with a 1st air diffuser means disposed so that the ascending flow makes contact with the contact material, a 2nd air diffuser means disposed so that the descending flow makes contact with the contact material, and so that the first and second air diffuser means are operated alternately.

0006

Operation of the Invention

When the first and second air diffuser means are operated alternately, the contact material is washed because the ascending and descending flows alternately make contact with the contact material so that neither the aerobic nor anaerobic microorgan-

isms increase in quantity, and the microorganism layer does not become so enlarged that the layer would become dislodged.

0007

Embodiments

Figures 1 and 2 show simplified cross sections of an embodiment of the device of this invention. 1 is the treatment tank, 2 is the wastewater, 3 is a plurality of contact material, 4 is the 1st air diffuser device, 5 is the 2nd air diffuser device, 6 is a blower or other high pressure air supply. The air diffuser devices 4 and 5 are connected to the high pressure air supply 6 via solenoid valves 7 and 8, respectively. Since each of the contact materials 3 is unitized with a microorganism holding part which may, for example, be comprised of float [sic] and fibrous material, so that at least during the aeration cycle, it is submerged in the wastewater 2. In this embodiment, the filling ratio of the microorganism holding part, which may be comprised of fibrous material, is limited by its dimensions so that the filling rate is approximately from 10% to 30%. Moreover, the contact material 3 is comprised of multiple elements disposed in contact material masses 10 which are disposed relatively densely, and the gaps between each contact material mass 10 become somewhat wider.

0008

The air diffuser device 4 is disposed beneath the contact material mass 10, and the air diffuser device 5 is disposed so that it is in locations where the contact material 3 is not disposed, which is to say that it is disposed so it is beneath the spaces between each of the contact material masses 10. Further, the solenoid valves 7 and 8 are actuated alternately in cycles of several minutes to several tens of minutes by the control part that is not shown, thereby alternating the release of aeration bubbles from the air diffuser devices 4 and 5. Note that the contact material 3 support structure, wastewater supply pipe, purified water takeoff device and other structural parts are omitted from the drawings.

0009

In the embodiment device constituted as described above, an ascending flow that is created by the aeration bubbles released from the diffuser device 4 in the direction shown by the arrow in Figure 1 when the air diffuser device 4 operates, ascends while making contact with the contact material 3, and the descending flow descends, passing in between each of the contact material masses 10. Moreover, when the air diffuser device 5 operates, the ascending flow caused by the aeration bubbles released from the air diffuser device 5 in the direction of the arrow in Figure 2 ascends without coming into contact with the contact material 3, and the descending flow descends while coming into contact with the contact material 3.

0010

In this way, the ascending and descending flows alternately contact the contact material 3, and the surface of the contact material is washed. Also, as a result of the alternating contact made by the oxygen-rich ascending flow and the relatively oxygen-poor descending flow, the aerobic and anaerobic microorganisms combine and propagate on the contact material 3, and their activation is controlled to an appropriate level. Therefore, the microorganism layer does not grow to the point that it would become dislodged, and there is no lopsided increase in either aerobic or anaerobic microorganisms.

0011

In this embodiment, a contact material 3 filling rate of about 10% to 30% has been selected. Here, the contact material filling rate means the volume of the filling material relative to the wastewater volume in the treatment tank. Typically, it is known that aerobic reactions are promoted when the quantity of contact material is small, and conversely that when there is a large quantity of contact material there is little contact between the oxygen from the microorganisms and the contact material, and conditions become anaerobic. However, aerobic reactions are necessary to reduce the biochemical oxygen demand (BOD), and since aerobic reactions are promoted when there is little contact material, it is desirable to minimize the contact material filling rate as a BOD countermeasure. On the other hand, in order to reduce total nitrogen (T–N), it is necessary to balance reciprocally the oxidizing reactions in aerobic conditions and the denitrifying reactions in anaerobic conditions, so as a T–N countermeasure, it is desirable to increase the contact material filling rate to a certain extent.

0012

In this connection, Figure 3 shows a typical example of research results obtained by the inventors. Compound wastewater consisting of glucose, polypeptone, and potassium phosphate was used. Using the batch method, the filling rate of the contact material was changed at a cycle of once per day. Our study of the relationship between the BOD and T–N reduction rate (or the removal rate) and the filling rate indicated that when the filling rate is between 0% and 20%, the highest levels of BOD are obtained. When the filling rate exceeds 20%, BOD immediately decreases. Moreover, T–N is extremely low when the filling rate is 0%, and shows a tendency to increase up to a filling rate of approximately 20%. However, when the filling rate exceeds approximately 20%, T–N immediately begins to decrease. This indicates that with approximately 20% as the boundary, when the filling rate is low, anaerobic reactions are insufficient, and when it exceeds 20%, aerobic reactions are insufficient. In terms of T–N, we believe that filling rates in the vicinity of 20% create the optimal balance between the aerobic and anaerobic reactions with the highest removal rate.

0013

Therefore, by selecting filling rates for the contact material of from 10% to 30%, and preferably from approximately 15% to 25%, good treatment results can be obtained for both BOD and T–N. This is also an effective method for improving the above-described air diffusion method in order to obtain good treatment reactions that enable sufficient reductions in both BOD and T–N levels. The filling rate of the contact material can be varied according to the treatment conditions and the type of waste water, so we believe it is possible to select from a range that is somewhat broader than the 10% to 30% indicated in Figure 3.

0014

Effect of the Invention

As described above, in the batch-type wastewater treatment device of this invention, the enlargement of the microorganism layer is prevented and its thickness of this layer is controlled automatically to an appropriate degree because the air diffuser means is designed so that the ascending and descending flows alternately make contact with the contact material. Moreover, since the microorganism layer is not dislodged due to enlargement, maintenance is simplified because there is no need for washing. Furthermore, by selecting a contact material

USF 141722

filling rate of approximately 10% to 30% as in the embodiment, an excellent balance between the aerobic and anaerobic reactions needed for denitrification can be obtained, and it is possible to increase the denitrification rate.

Brief Description of the Drawings

Figure 1	Simplified cross sectional view showing the constitution of an embodiment of this invention
Figure 2	Simplified cross sectional view showing the constitution of an embodiment of this invention

Symbols

1	Treatment tank
2	Wastewater
3	Contact material
4	1st air diffuser device
5	2nd air diffuser device
6	High pressure air supply
7	Solenoid valve
8	Solenoid valve
10	Contact material mass

Figure 3

y	Rate of reduction (%)
x	Contact material filling rate (%)
	Possible selection range
	Ideal selection range

Context Communications

Certification

I, Alex Kent, a professional translator, hereby certify that the attached English document, Publication of an Unexamined Patent Application JP4-250898, is a true and faithful translation from the Japanese language.

By ______________________ 9/23/04

Context Communications Inc. コンテキスト・コミュニケーションズ
Japanese-English Translation, Interpreting, Consulting 翻訳・通訳・コンサルティング
83 North Prospect Street Amherst, Massachusetts 01002 USA
Tel: 413-259-1288 Fax: 212-412-9056 E-mail: akent58@bellatlantic.net